

Tinnitus Retraining Therapy

Health Technology Assessment
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Background

Tinnitus is defined as the perception of sound in the region of the ears and/or head without external auditory stimulation. The sound may be similar to buzzing, ringing, whistling, hissing, or pulsing. The perception of the sound usually lasts for a few seconds or minutes only. Severe tinnitus symptoms may be associated with psychosomatic disturbances. (Leal 1998)

Despite the many theories concerning the cause of tinnitus, none are universally accepted. (Hilton 2004) Theories include:

- excessive or abnormal activity in the auditory system and cerebral areas
- genetic origin of tinnitus
- changes in cerebral blood flow
- abnormal processing of an auditory system signal resulting in continuous firing of cochlear fibres to the brain

The American Tinnitus Association points to a 19% prevalence of tinnitus in Americans (50 million individuals) with a greater prevalence in the 40 to 59 year age group. One to 2% of the population experiences debilitating tinnitus. (Hilton 2004) A random sample of 12,000 adults in Poland showed a prevalence of 20%, which translates to 1.6 million adults having had spontaneous tinnitus lasting over 5 minutes. This study found that constant tinnitus affects approximately 5%, and hyperacusis is perceived by 15% of the population. (Skarzynski 2000) Similarly, the point prevalence of prolonged, spontaneous tinnitus (multiple episodes lasting over 5 minutes) has been shown to be about 10% in the UK. (Leal 1998)

Schechter (Schechter 2002) indicates that the minimal basic components of an assessment for tinnitus treatment should include:

1. audiologic and tinnitus-specific history
2. audiologic evaluation and site of lesion testing
3. medical examination and medical clearance including bone conduction testing to test for cerumen on the tympanic membrane
4. tinnitus measurement, including loudness and pitch matching, minimum masking levels, and testing for residual inhibition, to quantify tinnitus perception
5. hearing aid related measurements
6. trial use of ear-level devices. Trial and error testing may occur within clinic with an inventory of stock devices
7. evaluation of sound generating devices
8. education/counseling

Tinnitus Retraining Therapy

Jastreboff proposed Tinnitus Retraining Therapy (TRT) in the late 1980s as a program for addressing and treating chronic tinnitus. TRT is based on a neurophysiological model and aims to allow a patient to habituate¹ to the tinnitus signal by modifying the neural connections linking the auditory with the limbic and autonomic nervous systems.

The neurophysiological approach to tinnitus assumes that signals that are new, important based on past experience, or radically different are likely to reach the cerebral cortex and establish a conditioned response. Effective treatment depends on unconditioning or retraining conditioned responses. Since stimulation of the limbic and autonomic systems causes the unpleasantness of tinnitus, treating tinnitus must address the reaction to the tinnitus rather than its perception.

Habituation of reaction involves blocking tinnitus-related neuronal activity from activating the limbic and autonomic nervous systems. Directive counseling and patient education are intended to achieve reaction habituation by removing the patient's emotional reaction to tinnitus.

Habituating to tinnitus perception involves blocking tinnitus-related neuronal activity from reaching the level of the cortex. Sound therapy is intended to achieve perception habituation by removing tinnitus from conscious perception.

The multidisciplinary TRT team, including physicians, audiologists, hearing therapists, clinical psychologists and counselors, adjust therapy to meet individual patient needs. The team provides a core services involving the 3 primary stages of direct counseling, sound therapy with instruments or devices, and follow-up visits.

Directive counseling works to demystify tinnitus and to eliminate anxiety and inappropriate beliefs about tinnitus. By removing the negative associations attached to tinnitus, counseling attempts to train the brain to classify tinnitus as an insignificant signal. The counseling is not a type of psychotherapy or biofeedback.

Sound therapy uses constant, low levels of background sound to reduce subconscious detection of tinnitus. TRT may involve the use of tabletop sound machines and sound generators to avoid silence. Use of instrumentation is based on the patient's severity of hearing loss, hyperacusis, and tinnitus.

Patient Category	Description	Instrumentation
0	No significant hearing loss or hyperacusis. Sound exposure does not cause prolonged worsening of tinnitus	None or tabletop sound machines
1	No significant hearing loss or hyperacusis. Sound exposure does not cause prolonged worsening of tinnitus.	Tabletop sound machine and wearable sound generators
2	Significant hearing loss and tinnitus. Hyperacusis and prolonged worsening of symptoms after sound exposure are absent.	Combination instruments or hearing aids
3	Significant hyperacusis, however tinnitus and hearing loss	Combination instruments,

¹ Habituation is defined as the decline of a conditioned response following repeated exposure to the conditioned stimulus.

	may or may not be present. Worsening of hyperacusis and tinnitus after sound exposure is absent.	or sound generators followed by hearing aids
4	Hyperacusis as a dominant complaint. Hyperacusis and tinnitus worsen following exposure to sound	Sound generators or combination instruments

While the recommended duration of treatment is between 12 and 24 months, compliant patients may experience improvement between the third and sixth month of TRT.

The only reported contraindication for TRT is use of benzodiazepines, which may impair brain plasticity and reduce learning ability.

TRT does not have a published protocol. The Jastreboffs and Dr. Jonathan Hazell provide TRT training at 3-day instructional courses and workshops. Attendance at one of these courses is currently the only means to receive training to perform TRT. By the end of 2002, 15 courses had been offered in the United States and London. Over 250 health professionals practice TRT in approximately 100 centers. (Henry 2002) (Jastreboff 2003) (Kroener-Herwig 2000) (Leal 1998) (OHSU 2004)

Criticism of TRT

In 1998, Wilson published a critical analysis of TRT with reference to the directive counseling component. The assessment states that "TRT does not appear to represent a fundamentally new approach to tinnitus" as the distinction between directive counseling and cognitive therapy were not clear. (Wilson 1998)

In 2000, several researchers and practitioners active in the field of tinnitus treatment published an assessment of TRT, its neurophysiological founding, its treatment concept, and the status of its evaluation. (Kroener-Herwig 2000)

The assessment states that Jastreboff's theory "remains partially vague, relies of global knowledge, and lack specificity regarding tinnitus-related neurophysiological processing." They did not find anything new in Jastreboff's psychological ideas. Instead the authors considered the ideas to be less specific and less well-developed compared to other models. For example, the Jastreboff model neglects modification of avoidance behaviors motivated by tinnitus.

The authors of the assessment also criticize Jastreboff's model for not involving specially trained psychologists in TRT counseling. The authors suggest that disabled, chronic tinnitus sufferers may require more intensive and sophisticated intervention programs to change their cognitions, emotions, and behavior.

Finally, the authors report that the diagnostic and evaluation instruments used for TRT are of low methodological quality compared with well-established standards in therapy research. For example, the initial interview is susceptible to social desirability bias.

Evidence

A search of the term “tinnitus” was conducted using the University of York’s Centre for Reviews and Dissemination database to find existing technology assessments or reviews of TRT. Searches of the terms “tinnitus” and “retraining” were conducted on PubMed. Results were limited to English language clinical studies published between December 1997 and May 2004.

Evaluations of TRT

I. Systematic Review of TRT

- a. One systematic review of TRT has been conducted. Leal searched literature published through December 1997. (Leal 1998) Studies assessing only one component of TRT were excluded because treatment effect for TRT cannot be attributed to any single component.

The review identified one published study for inclusion. The Sheldrake study reported a case series involving 149 patients attending a private center in London. The study collected data retrospectively and showed that 143 patients (96%) reported improvement in tinnitus awareness with 28 patients (19.6%) experiencing periods of time when tinnitus was totally absent. The average duration of symptom free periods was 10.52 days.

The review concluded that there was no evidence to suggest that TRT is effective in the treatment of debilitating tinnitus in adults.

II. Prospective Evaluations of TRT and Tinnitus Management Programs

The prospective case series study published since 1997 does not include comparison groups or criteria for patient selection. As a result, it cannot be determined whether improvement is causally related to TRT. Because patient selection criteria were not stated, the studies do not suggest a patient subgroup most likely to respond to TRT.

- a. Berry’s study aimed to quantify the impact of tinnitus by comparing audiologic parameters, validated patient-based THI results, and responses to a subjective self-assessment survey. The study also addressed self-perceived disability in patients undergoing TRT using the Tinnitus Handicap Inventory (THI). (Berry 2002)

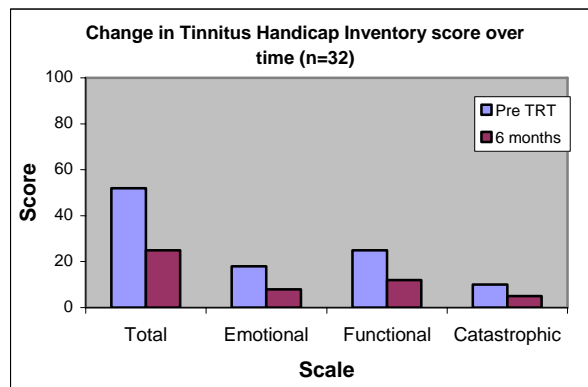
Outcomes at 6 months were measured with standard audiologic testing, including audiometry for pure-tone average (PTA) and speech discrimination score (SDS), reflex testing, and otoacoustic emission testing. Patients also underwent testing for pitch matching, dynamic range, loudness discomfort level (LDL), loudness matching, and minimum masking. Disability was measured with the 100-point, 25-item THI survey. The THI provides a total score and 3 subscale scores in function, emotion, and catastrophe.

Study Population: The study included 32 patients (mean age 54.5 years) from the University of Maryland Tinnitus and Hyperacusis Center. All patients underwent standard assessment, including full history and physical examination by an otolaryngologist and MRI to rule out retrocochlear disease.

Results: The study did not detect significant correlations between baseline THI scores and audiologic parameters. However, baseline THI scores and subjective tinnitus characteristics correlated between subjective presence of sound tolerance problems and higher total THI scores.

When comparing audiologic parameters at initial visit and 6-month follow-up, right and left PTA and SDS remained within normal limits. The 9 patients who initially presented with tinnitus and hyperacusis as determined by LDL scores showed a significant improvement following TRT.

All subsets of THI showed significant improvement following TRT.



There was no association between severity of THI scores and PTA or SDS. There were no associations between loudness matching or minimum masking level and THI scores. Therefore, the impact of tinnitus on a patient's well-being appears to be independent of the psychoacoustical properties of the tinnitus.

Conclusion: The researchers indicate that their results show significant improvement in THI scores following 6 months of TRT. Therefore, TRT improves self-perceived disability induced by chronic tinnitus as reflected by improved THI total score after 6 months of TRT.

II. Prospective Evaluations of Tinnitus Management Programs

One randomized trial has been published reporting on the effects of tinnitus management programs, but this study is subject to substantial bias. While including control groups allows for comparison of the services, the study does not indicate whether baseline characteristics differed between the groups. In addition, the authors do not report whether any inclusion or exclusion criteria were applied to patients to determine study participation. This study experienced substantial loss to follow-up and did not practice intention-to-treat. Finally, the study design does not include blinding of either assessors or subjects.

- a. Dineen conducted a randomized study of tinnitus management programs. The initial pool of 96 patients completed a history questionnaire, underwent assessment of psychological reaction to tinnitus and stress, and received audiometry testing. (Dineen 1999)

Outcomes were measured with a VAS for psychological reaction and audiometry testing at 3 and 12 months.

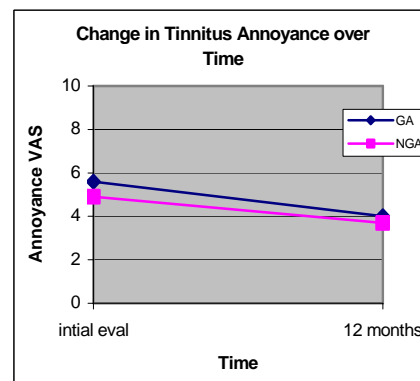
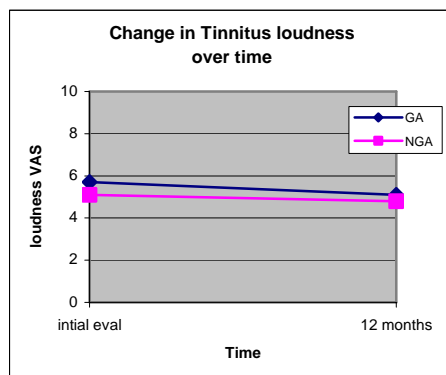
Patients were randomized to one of 4 training programs, which were conducted in two 3-hour sessions.

Number of patients per group and at follow-up

Group	Description	Attended initial assessment	Attended group training	3-month follow-up	12-month follow-up
I	Information only	28	18	18	17
ID	Information with long term low level white noise (LTWN)	20	14	13	12
IR	Information with relaxation training	28	23	23	21
IDR	Information, LTWN, and relaxation	20	17	17	15

Results: The results of 65 subjects (mean age 54.4 years) were reported.

The analysis grouped subjects who attended tinnitus management training groups (GA) with those who did not attend (NGA) in order to compare results. The VAS for tinnitus loudness and annoyance declined for both groups. The study did not detect significant differences between the GA and NGA subjects.



The majority of subjects reported improvement in subjective measures of tinnitus at 3 and 12 months. The rate of improvement was not significant and slowed over time. The change in tinnitus perception did not vary greatly between the 4 groups. There were few significant differences between groups on any of the psychological or audiological measures of tinnitus at 12 months.

Number of patients who believed that
tinnitus was something to get used to

	Number of patients	Percent of Patients
IDR	4	27%
I	11	65%
ID	8	67%
IR	14	67%

The analysis also grouped LTWN users and compared results to non-users. Neither group demonstrated significant changes in the perception of tinnitus loudness, audiological measures of tinnitus loudness, level of awareness, or level of stress at 12 months.

Sixteen subjects (53% of those fitted) reported that they were still regularly using their LTWN device at 12 months. The LTWN users did not differ significantly from non-users in their level of habituation to tinnitus over time.

Conclusion: The study demonstrated that tinnitus management training significantly influences habituation to tinnitus. However, none of the three forms of tinnitus management training compared in this study were found to be more effective than the others in facilitating habituation.

III. Retrospective Evaluations of TRT

Three retrospective case series studies have been published since 1997. The lack of baseline measurements, comparison groups, predetermined outcomes measurements, and patient homogeneity prohibits the ability to draw conclusions on efficacy.

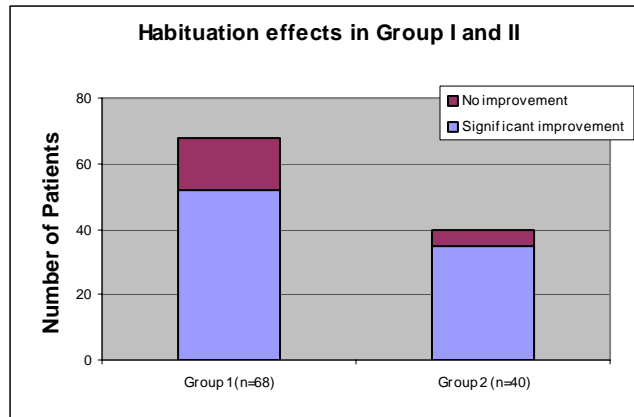
- a. Bartnik published two retrospective investigations to study the effects of habituation. Because patient populations likely overlapped, the results are presented together. (Bartnik 2001) (Bartnik 2001a)

One article described data on 108 patients after 12 months of TRT.

	Group 1	Group 2
	No significant hearing loss or hyperacusis. Sound exposure does not cause worsening of tinnitus	Significant hearing loss and tinnitus. Sound exposure does not cause worsening of hyperacusis.
Number of patients	68	40

Significant improvement was defined as a

- decrease in at least 3 parameters by 20% and
- resumption of at least one activity that tinnitus and/or hyperacusis previously prevented

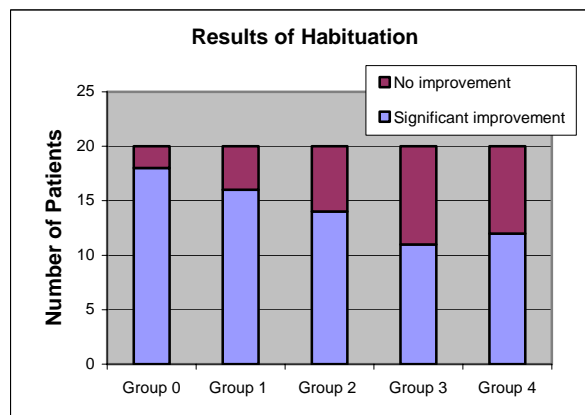


The study did not detect any significant differences following TRT between groups. Furthermore, the presence of subjective hearing loss with tinnitus had no significant influence on the effectiveness of habituation.

The second article described patients based on the following categories.

	Group 0	Group I	Group II	Group III	Group IV
	No significant hearing loss/hyperacusis. Sound exposure does not cause prolonged worsening of tinnitus.	No significant hearing loss/hyperacusis. Sound exposure does not cause prolonged worsening of tinnitus.	Significant hearing loss and tinnitus. Hyperacusis and prolonged worsening of symptoms after sound exposure are absent.	Significant hyperacusis. Tinnitus and hearing loss may or may not be present. Worsening of hyperacusis and tinnitus after sound exposure is absent.	Hyperacusis is dominant complaint. Hyperacusis and tinnitus worsen following exposure to sound.
Patient Number	20	20	20	20	20

The study found that TRT was less effective for Categories III and IV patients.



The study concludes that the results after a minimum of 10 months' therapy are different in each severity category, but 70% of cases showed improvement.

- b. Gold presented information on 152 consecutive patients who were treated for at least 6 months. (Gold 2000) The study aimed to answer 3 questions:
 - 1. Is the patient performing activities that were prevented or interfered with previously?
 - 2. Is there a change in the level of annoyance of tinnitus when it is perceived?
 - 3. Is there a change in the percentage of time when the patient is aware of the tinnitus?Improvement was defined as a change in at least 2 areas with at least 20% improvement.

Review of data found that 129 patients (84.9%) received full treatment, and 105 patients showed significant improvement.

Alternative Treatments for TRT

I. Systematic Review of Ginkgo biloba for Tinnitus

- a. The Cochrane Collaborative conducted a review of Ginkgo biloba for tinnitus. (Hilton 2004) Hilton's search included randomized controlled trials assessing the effect of Ginkgo biloba in patients with tinnitus. Outcome measures included change in loudness and severity.

The search of literature published through December 2003 resulted in 2 trials. The Drew study (2001) evaluated 978 patients with tinnitus of 1 to 5 years. Patients received placebo or 150 mg of LI 1370 daily for 12 weeks. The study did not detect any differences between the control and experimental groups as 13.6% of active and 12.4% of placebo patients reported improvement.

The Morgenstern study (1997) evaluated 99 patients with a mean of 4.5 years of tinnitus. Patients received 12 weeks of placebo or 120 mg Egb761. The study did not detect a significant difference between groups on change in tinnitus loudness.

Trials not included in the analysis suggest that Ginkgo biloba may benefit tinnitus associated with cognitive insufficiency. A central vascular insufficiency or neural metabolic disorder may cause tinnitus in cognitive insufficiency. As a result, ginkgo biloba may improve cognitive functioning to allow tinnitus habituation.

The review concludes that the limited evidence does not demonstrate that Ginkgo biloba is effective for tinnitus. There is no reliable evidence on the effect of Ginkgo biloba on tinnitus in patients with cerebral insufficiency.

II. Systematic Review of Randomized Clinical Trials (RCT) for Tinnitus

Dobie conducted a search of literature published through 1998 based on the keywords "tinnitus" and "randomized clinical trials". (Dobie 1999) Exclusion criteria included tinnitus as a side effect, trials with intravenous lidocaine, and studies comparing treatment to waiting list group.

The search resulted in 69 RCT evaluating 11 broad categories of treatments, which are presented below.

Davies notes that the treatments generally produced small and clinically insignificant changes. The review of RCT concludes that there are few well-established specific treatments for subjective tinnitus. None of the treatments eliminate tinnitus more frequently than placebo or provide long-term reduction of impact on everyday life.

- a. Carbamazepine, an anticonvulsant drug, was studied in 4 RCT despite significant side effects and long-term risk of bone marrow suppression. They all failed to show benefit.

- b. Tocainide and related drugs for life-threatening cardiac arrhythmias were studied in 7 RCT. When considered together, the trials failed to show benefit against tinnitus. As a class, oral antiarrhythmic drugs are not a favored option for tinnitus.

Number of patients experiencing a positive response
to Tocainide for tinnitus by treatment group

Author (year)	Dose/day (mg)	Active	Placebo
Blayney (1985)	200-600	3/32	0/32
Hulshof (1985)	900	1/24	3/24
Hazell (1984)	1200	4/10	2/10
Shea (1981)*	1200-2400	13/39	1/17
Cathcart (1982)	1200	6/26	4/26
Lenarz (1986)*	400-2400	10/40	4/40
Emmett (1984)	800-1600	?/24	?/24

*statistically significant

- c. Benzodiazepines have been included in 2 trials. The Shulman single-blinded study included 4 drugs (clonazepam, diazepam, flurazepam, and oxazepam), along with carbamazepine and 3 different antihistamines in 66 patients. Clonazepam and oxazepam outperformed antihistamines.

Johnson's RCT compared alprazolam to placebo. The active drug reduced tinnitus loudness as measured by matching and VAS while placebo showed no improvement in either measure.

- d. Tricyclic antidepressants were studied by 3 researchers. Mihail's crossover trial of trimipramine did not show differing outcomes between active and placebo.

Dobie's study of 92 patients showed that 67% of patients receiving 50 to 150 mg/d of nortriptyline reported global benefit compared to 40% of placebo patients. Placebo patients improved almost as much as active drug patients. Podoshin compared amitriptyline, placebo pills, active biofeedback, and placebo biofeedback. Active amitriptyline was superior to placebo on sleep interference (28% v 5%) and activities (16% v 5%).

- e. Melatonin, a pineal gland product, was not found to show significant global benefit in Rosenberg's cross over trial of 30 patients. Seven of 15 melatonin and 3 of 15 placebo patients reported improved global benefit.
- f. Maskers have been studied in comparison to placebo devices and nondrug therapies. Erlandsson found a significant difference between active, wearable devices compared to placebo devices in improvement of tinnitus. Stephens and Corcoran found that few maskers scored better than hearing aids when measuring difficulty falling asleep. Hearing aids were better than tinnitus instruments in reducing obsessionality.

In the 3 RCT comparing masking to other nondrug therapies, Attias found a cassette on a Walkman was inferior to self-hypnosis. Jansson reported that maskers worn at least 6 hours/day reduced tinnitus loudness more than acupuncture. Finally, Jakes found few differences in multiple outcomes between

masking, cognitive therapy, a combination of both, and placebo masking. Masking combined with cognitive therapy showed a greater effect on emotional distress at 3 months compared to other groups.

- g. Magnetic stimulation did not have an effect over placebo in Coles' trial involving wearing magnets in the ear canal. Roland's study of 150 patients found that 24% of active stimulation and 13% of placebo patients reported improvement in tinnitus. However, active treatment patients detected a tingling sensation.
- h. Ultrasound was not found by Carrick to have an effect over placebo when applied to the mastoid for 10 minutes.
- i. Biofeedback was studied in 3 trials. Haralambous' control group receives "counterdemand" biofeedback, in which patients were told not to expect improvement for 5 weeks. Neither treatment group experienced an effect compared to baseline.

Podoshin found that 43.5% of active biofeedback patients improved in sleep interference compared to 5% of control group who listened to EMG activity of other subjects.

- j. Hypnosis during individual sessions was found by Mason to be more effective than group counseling sessions. Attias reported that self-hypnosis outperformed masking and attentiveness counseling
- k. Psychotherapy has been studied by several researchers. Ireland compared relaxation training with and without counterdemand and found no difference in outcomes. Jakes did not find any difference in results between relaxation alone and relaxation with attention switching therapy. Lindberg did not detect a difference in outcomes between different behavioral techniques with cognitive therapy. Dineen compared a group receiving information only to groups receiving information with relaxation or information with a white noise device. The study found no significant differences between groups.

In contrast, Davies found relaxation reduced annoyance more than cognitive therapy at 1 month, but results dissipated at 4 months. Henry found that cognitive/coping therapy plus education was more effective than education alone in reducing distress and handicap, but results dissipated at 12 months.

Costs and Codes

The current charges by one TRT provider group in the Seattle, Washington area follow.

Type of Visit	Length of visit	Costs
Initial tinnitus evaluation, treatment plan, and counseling without audiologic evaluation	2 hours	\$300
Initial tinnitus evaluation, treatment plan, and counseling with audiologic evaluation	2.5 to 3 hours	\$300 + \$90 to \$185
Sound generator fitting	1 to 1.5 hours	\$650 to \$950 per ear
Hearing aid fitting	1 to 1.5 hours	\$850 to \$2700 per ear
5 week, 3 month, 6 month follow-up counseling and reevaluation	.5 hours per visit	\$450 for 3 visits
12 month, 18 month, 24 months reevaluation and counseling	1.5 to 2.5 hours per visit	\$300 per visit

In 1998, the charges for a course of TRT at a tertiary referral center in London ranged from £1500 to £2500. (Leal 1998)

TRT does not have a unique CPT code at this time.

Payers

Aetna, Blue Cross of California, and the Regence Group do not cover TRT because treatment of tinnitus with TRT is considered investigational. (Aetna 2004) (Blue 2004) (Regence 2003)

Washington State Department of Labor and Industries Experience

In 2003, the Washington State Department of Labor and Industries covered tinnitus services for 87 injured workers with diagnosis codes of 388.3, 388.31, and 388.32.

Procedures relevant to tinnitus, excluding office visits and consultations, reimbursed by the department for these patients include:

Code	Description of Code	Number of Paid Bills	Average Charged Amount	Average Allowed Amount
92557	Comprehensive audiometry threshold evaluation and speech recognition	93	\$94.76	\$62.89
92567	Tympanometry (impedance testing)	73	\$41.10	\$28.08
V5266	Battery for use in hearing device	32	\$42.08	\$41.45
92568	Acoustic reflex testing	31	\$28.99	\$20.20
V5251	Hearing aid, digitally programmable analog, binaural	11	\$3,090.56	\$3,090.56
96117	Neuropsychological testing battery with interpretation and report	10	\$717.10	\$506.99
V5252	Hearing aid, digitally programmable, binaural	9	\$3,227.04	\$3,090.56
90806	Individual psychotherapy, insight oriented, behavior modifying and/or supportive	6	\$125.00	\$125.00
92504	Binocular microscopy	6	\$62.43	\$53.00
92588	Evoked otoacoustic emissions; comprehensive or diagnostic evaluation	6	\$129.83	\$99.48
92543	Caloric vestibular test, each irrigation	5	\$60.40	\$39.86
92552	Positional nystagmus test, minimum 4 positions	5	\$41.90	\$23.04

Conclusions

Tinnitus retraining therapy (TRT) uses a neurophysiological model and aims to habituate a patient to the reaction and perception of subjective tinnitus. The core components of TRT are direct counseling, sound therapy, and follow-up consultations.

TRT has been criticized for not clearly distinguishing the difference between counseling and cognitive therapy, not involving trained psychologists, and not using standard diagnostic and evaluation strategies.

One prospective study has been conducted to evaluate the effectiveness of TRT. The Berry case series study found that baseline Tinnitus Handicap Inventory (THI) scores correlated with subjective tinnitus characteristics. Six months following TRT, the 32 patients in the study experienced significant improvement on the THI suggesting reduced disability. Due to the lack of comparison groups, the results of the study do not provide clear evidence that TRT effects disability related to tinnitus.

Three retrospective studies have been published since 1997. The lack of baseline measurements, comparison groups, predetermined outcome measurements, and patient homogeneity prohibits the ability to draw conclusions on efficacy.

Many alternative treatments for tinnitus exist. Systematic reviews suggest that evidence does not demonstrate efficacy for the following treatments: ginkgo biloba, carbamazepine, drugs for cardiac arrhythmias, melatonin, magnetic stimulation, and ultrasound. In contrast, the evidence suggests that patients may respond to benzodiazepines, masking, biofeedback, and psychotherapy. The author of the review states that the treatments generally produce clinically insignificant changes and that few well-established treatments exist.

The total cost of a full, 24-month course of TRT ranges from approximately \$3500 to \$5700.

Due to the lack of prospective trials with comparison groups, the efficacy of TRT for subjective tinnitus has not been established. Therefore, TRT is considered investigational and controversial.

References

- Aetna. "Tinnitus Treatments." *Clinical Policy Bulletins*. 2004 February; Available at www.aetna.com/cpb/data/CPBA0406.html. Last accessed on June 2, 2004.
- Bartnik, G, et al. "Experiences in the treatment of patients with tinnitus and/or hyperacusis using the habituation method." *Scand Audiol*. 2001; 30S(52) :187-190.
- Bartnik, G, et al. "Effects of tinnitus retraining therapy (TRT) for patients with tinnitus and subjective hearing loss versus tinnitus only." *Scand Audiol*. 2001a; 30S(52): 206-208.
- Berry, JA, et al. "Patient-based Outcomes in Patients with Primary Tinnitus Undergoing Tinnitus Retraining Therapy." *Arch Otolaryngol Head Neck Surg*. 2002; 128: 1153-1157.
- Blue Cross of California. "Treatment of Tinnitus." *Medical Policy*. 2004 January; Available at <http://medpolicy.bluecrossca.com/policies/medicine/tinnitus.html>. Last accessed on June 2, 2004.
- Dineen, R, et al. "The influence of training on tinnitus perception: an evaluation 12 months after tinnitus management training." *British J of Audiology*. 1999; 33: 29-51.
- Dobie, RA. "A Review of Randomized Clinical Trials in Tinnitus." *Laryngoscope*. 1999; 109: 1202-1211.
- Gold, SL, et al. "Celebrating a Decade of Evaluation and Treatment: the University of Maryland Tinnitus & Hyperacusis Center." *American Journal of Audiology*. 2000; 9: 69-74.
- Henry, JA, et al. "Assessment of Patients for Treatment with Tinnitus Retraining Therapy." *J Am Acad Audiol*. 2002 Nov-Dec; 13: 523-544.
- Hilton, M and Stuart, E. "Ginkgo Biloba for Tinnitus." *The Cochrane Library*. 2004; Issue 2. Chichester, UK: John Wiley & Sons, Ltd.
- Jastreboff, PJ and Jastreboff, MM. "Tinnitus Retraining Therapy for patients with tinnitus and decreased sound tolerance." *Otolaryngol Clin N Am*. 2003; 36: 321-336.
- Kroener-Herwig, B et al. "Retraining therapy for chronic tinnitus: a critical analysis of its status." *Scand Audiol*. 2000; 29:67-78.
- Leal, P and Milne, R. "Tinnitus Retraining Therapy." *Development & Evaluation Committee Report*. 1998 March; 83: 1-20.
- OHSU. "OHSU Tinnitus Clinic." Available at www.ohsu.edu/ohrc/tinnitusclinic/. Last accessed on June 2, 2004.

The Regence Group. "Treatment of Tinnitus." *Medical Policy*. 2003 October; Available at www.regence.com/trgmedpol/alliedHealth/ah25.html. Last accessed on June 2, 2004.

Schechter, MA and Henry, JA. "Assessment and Treatment for Tinnitus Patients Using a 'Masking Approach'." *J Am Acad Audiol*. 2002 Nov-Dec; 13(10): 545-558.

Skarzynski, H, et al. "Organization of Tinnitus Management in Poland." *Acta Otolaryngol*. 2000; 120: 225-226.

Wilson, PH, et al. "A critical analysis of directive counseling as a component of tinnitus retraining therapy." *British Journal of Audiology*. 1998; 32: 273-286.